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Nanotechnology Systems

Advantages of Hydrostatic Oil Bearing Spindles for Ultra Precision Grinding Applications:

- Hydrostatic and Aerostatic spindles have similar theoretical rotational accuracy.
- Because the stiffness of the bearing (both hydrostatic and aerostatic) is proportional to supply pressure, and film compressibility, hydrostatic bearings have much higher static stiffness (assuming common geometries)
- The overwhelming advantage of oil hydrostatic bearings is their extremely high damping ratio. The damping ratio of a hydrostatic bearing is several hundred times greater than that of an aerostatic bearing. This is due to the difference in fluid viscosity and compressibility between oil and air. Hydrostatic bearings are the only type of bearings that effectively combine Ultra High Accuracy, Very High Stiffness, and Ultra High Damping Ratio (a.k.a. – Vibroresistence).
- Damping Ratio is extremely important when hard and brittle materials are machined, regardless of process (grinding, turning, or milling). This is one of the reasons slides for Ultra Precision equipment have evolved from aerostatic bearing technology to oil hydrostatic bearing technology. Even when cutting forces are very small (finish grinding for example) a high damping ratio allows you to achieve better surface finishes (particularly with interrupted cuts) which essentially leads to increased machining productivity.
- Typically, high speed spindles utilize an integrated (or integral) motor. Electromagnetic forces between the stator and rotor have radial component influences that can ultimately affect the shaft's rotational accuracy. Hydrostatic oil bearings dramatically reduce the rotational inaccuracies caused by motor influence.
- Generally, when an AC integral motor is used the rotor can reach higher temperatures, which will ultimately transfer through to the spindle shaft. Hence, we have designed internal cooling into our motor cavities (utilizing chilled oil) to control thermal expansion and maintain long-term stability.

Other Unique Advantages of Nanotech Ultra-Precision Machining Systems

Nanotech Machines incorporate the latest precision engineered state-of-the-art designs, providing significantly advanced features not offered by our competitors. Even with these unique advantages, our prices and deliveries are still very competitive.

- Liquid-cooled, temperature controlled, Professional Instruments groove-compensated air bearing workspindles for long-term stability and unparalleled accuracy. Thermal stability is extremely important for your workholding spindle. If you have spindle growth from thermal expansion, it can result in tilt motion or transfer of heat to the slideways, both of which will adversely affect performance.
- Windows NT based CNC front-end with operating screens and control panels that resemble a Fanuc CNC (for ease of training and operation).
- Athermalized scale mounting devices & spindle housings for enhanced thermal stability.
- Hydrostatic oil bearing grinding spindles which provide unmatched stiffness and damping characteristics (critical to sustainable deterministic microgrinding of optical components).
- On-machine Workpiece Measurement & Error Compensation System with unique aspheric algorithm correction that is unequalled in accuracy and repeatability.
- A host of unique accessories including fully automated LVDT and Optical Tool Set Stations with on-screen viewing, and a parallel motion Micro Height Adjust Tool Holder with unprecedented stiffness at the cutting tool.